

INP-MAY 03

Inland Navigation Planning

Current Practice

May 9, 2003

Paul J. Hanley

Economist, CELRD-CM-P

513 684-3598

<http://paul.j.hanley@usace.army.mil>

INP-MAY 03

I. Planning Process

II. Evaluation Framework

III. Evaluation Procedures

IV. Practical Issues



I. Planning Process



INP-MAY 03

“Planning Guidance Notebook”

Ref. ER 1105-2-100, 22 April 2000

[http://www.usace.army.mil/inet/functions/cw/cecwp/
General_guidance/guidance.htm](http://www.usace.army.mil/inet/functions/cw/cecwp/General_guidance/guidance.htm)

Six Steps

- ✓ Identifying Problems and Opportunities
- ✓ Inventorying and Forecasting Conditions
- ✓ Formulating Alternative Plans
- ✓ Evaluating Alternative Plans
- ✓ Comparing Alternative Plans
- ✓ Selecting a Plan

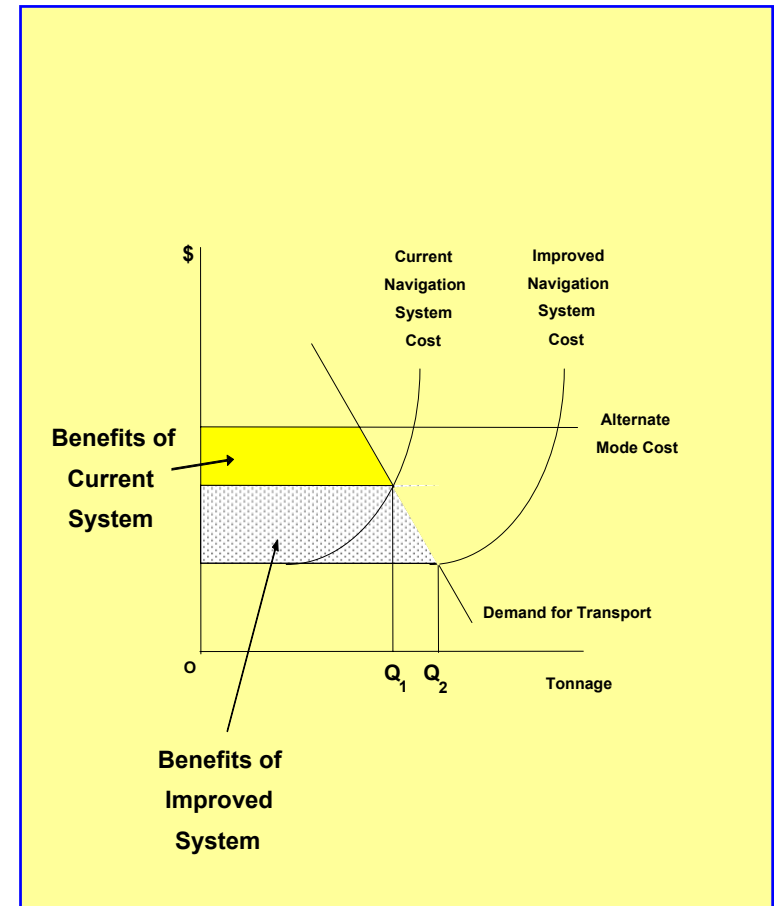
II. Evaluation Framework

- ✓ **NED Benefits**
- ✓ **Without-Project Condition**
- ✓ **With-Project Condition**
- ✓ **Evaluation Procedures**

Current Practice and Issues

Development of the Without Condition is the Starting Point for Successful Analysis

- Determine structural reliability (condition)
- Optimize non-structural management measures (capacity)
- Estimate traffic movements (demand)
- Evaluate incremental benefits of alternate maintenance scenarios and non-structural measures



A man in a black graduation gown and mortarboard cap is holding a white diploma. He is standing in front of a large, elaborate floral arrangement featuring red poinsettias and white flowers. In the top left corner, there is a blue square logo with a yellow crescent moon and a star.

III. Evaluation Procedures

A large cargo ship is sailing on a body of water, passing under a large suspension bridge. The ship is filled with various colored cargo containers. The bridge has a complex steel truss structure. The scene is captured from a slightly elevated angle, showing the ship's deck and the bridge's support structure.

INP-MAY 03

“evaluation of navigation projects shall be conducted following the process described in para 2-3e of this regulation.”

(ER 1105-2-100)



INP-MAY 03

“ The base economic benefit of a navigation project is the reduction in the value of resources required to transport commodities.”

(ER 1105-2-100)



INP-MAY 03

“ten steps are used to estimate benefits associated with improvements of the inland navigation system.”

(ER 1105-2-100)

INP-MAY 03

Step 1 – Identify the Commodity Types

(ER 1105-2-100)

LRD Navigation Overview

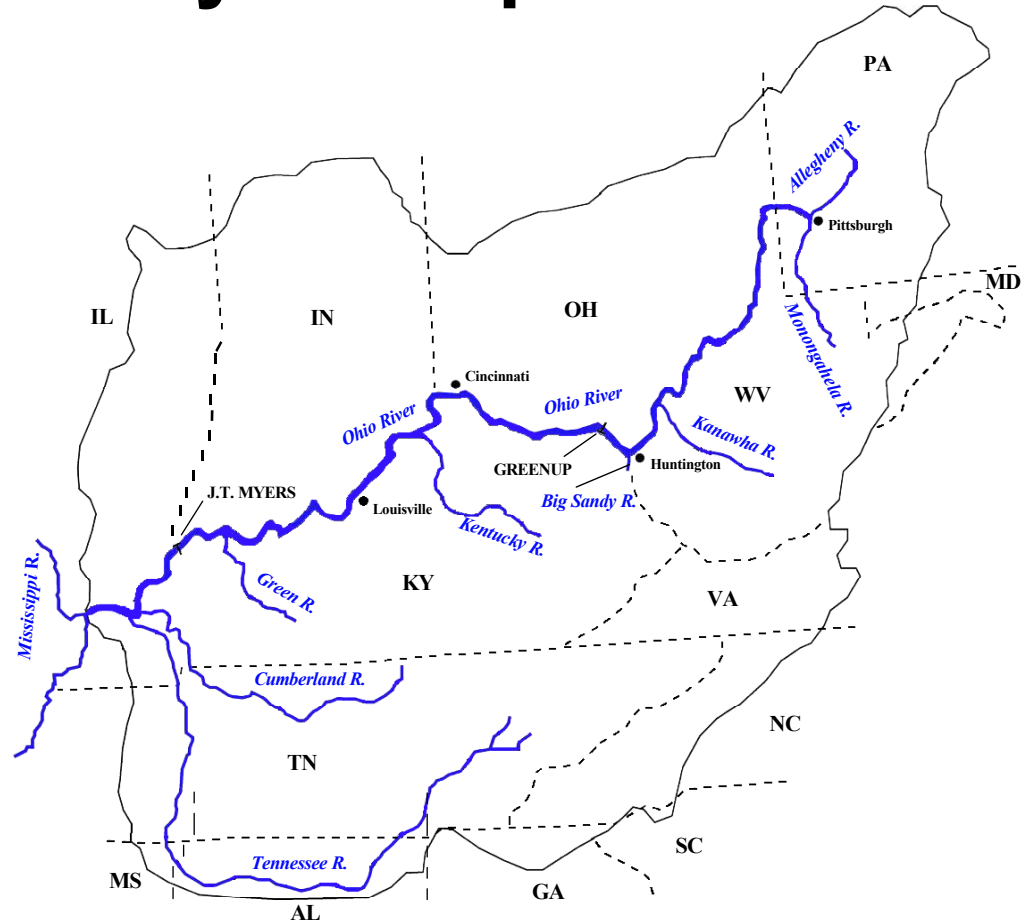
Major Users of Waterway Transportation

1. High Dependence

- Coal Mining
- Electric Generating
- Coke/Steel Production
- Petrol-Chemicals
- Construction

2. Low Dependence

- Agriculture
- Wood Products



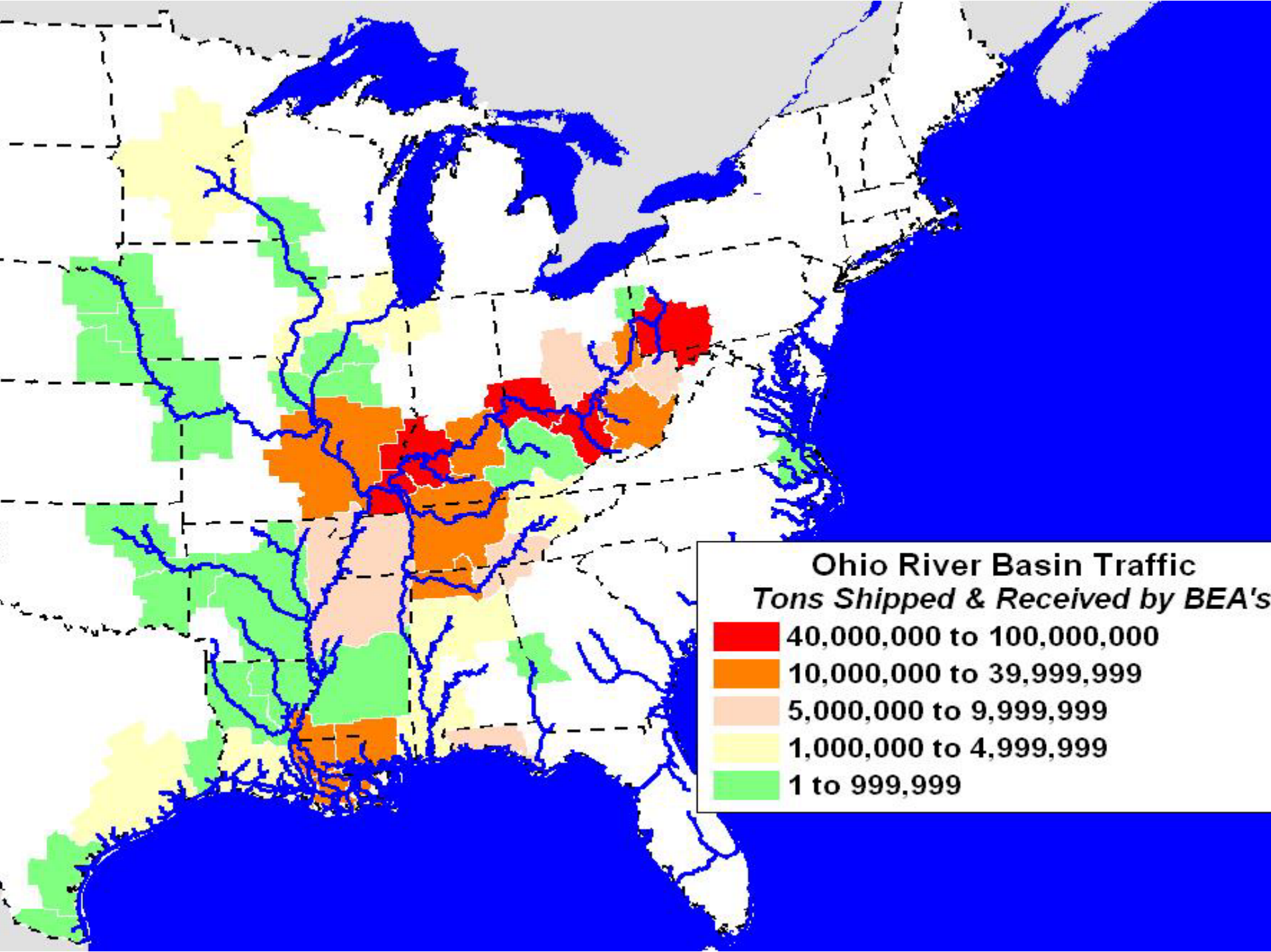
Ohio River Basin

The background of the slide is a photograph of a large, multi-lane bridge spanning a wide river. In the foreground, a large barge is being pushed or pulled by a tugboat. The barge is loaded with numerous colorful shipping containers stacked in rows. The bridge's steel truss structure is visible in the upper half of the image, and the water reflects the light. The overall scene is industrial and maritime.

INP-MAY 03

Step 2 – Identify the Study Area

(ER 1105-2-100)



The background of the slide is a photograph of a large, multi-lane bridge spanning a wide body of water. In the foreground, a large cargo ship is visible, its deck filled with numerous colorful shipping containers. The ship is moving towards the right side of the frame. The bridge's steel truss structure is prominent in the upper half of the image.

INP-MAY 03

Step 3 – Determine Current Commodity Flow

(ER 1105-2-100)

2001 Ohio River System

Commodity	KTons
Coal	157,088
Petro. (Crude & Refined)	20,517
Aggregates	46,686
Grains	18,156
Chemicals	10,619
Ores, Minerals	6,912
Iron Ore & Steel	11,026
Other	8,914
Total	279,918

The background of the slide is a photograph of a large, multi-arched steel truss bridge spanning a wide river. In the foreground, a long barge is being pushed or pulled by a tugboat, carrying a large number of colorful intermodal containers stacked in neat rows. The water is calm, and the sky is overcast.

INP-MAY 03

Step 4 – Determine Current Cost of Waterway Use

(ER 1105-2-100)

The background of the slide is a photograph of a large, multi-lane bridge spanning a body of water. In the foreground, a large cargo ship is visible, carrying several stacks of colorful intermodal containers. The ship is moving along a waterway that passes under the bridge. The overall scene is slightly hazy, suggesting a distant or elevated perspective.

INP-MAY 03

Step 5 – Determine Current Cost of Alternative Movement

(ER 1105-2-100)

The background of the slide is a photograph of a large, multi-arched steel truss bridge spanning a wide body of water. In the foreground, a large cargo ship is visible, its deck covered with numerous colorful shipping containers. The ship is moving towards the right side of the frame. The overall scene is slightly hazy, giving it a soft, atmospheric feel.

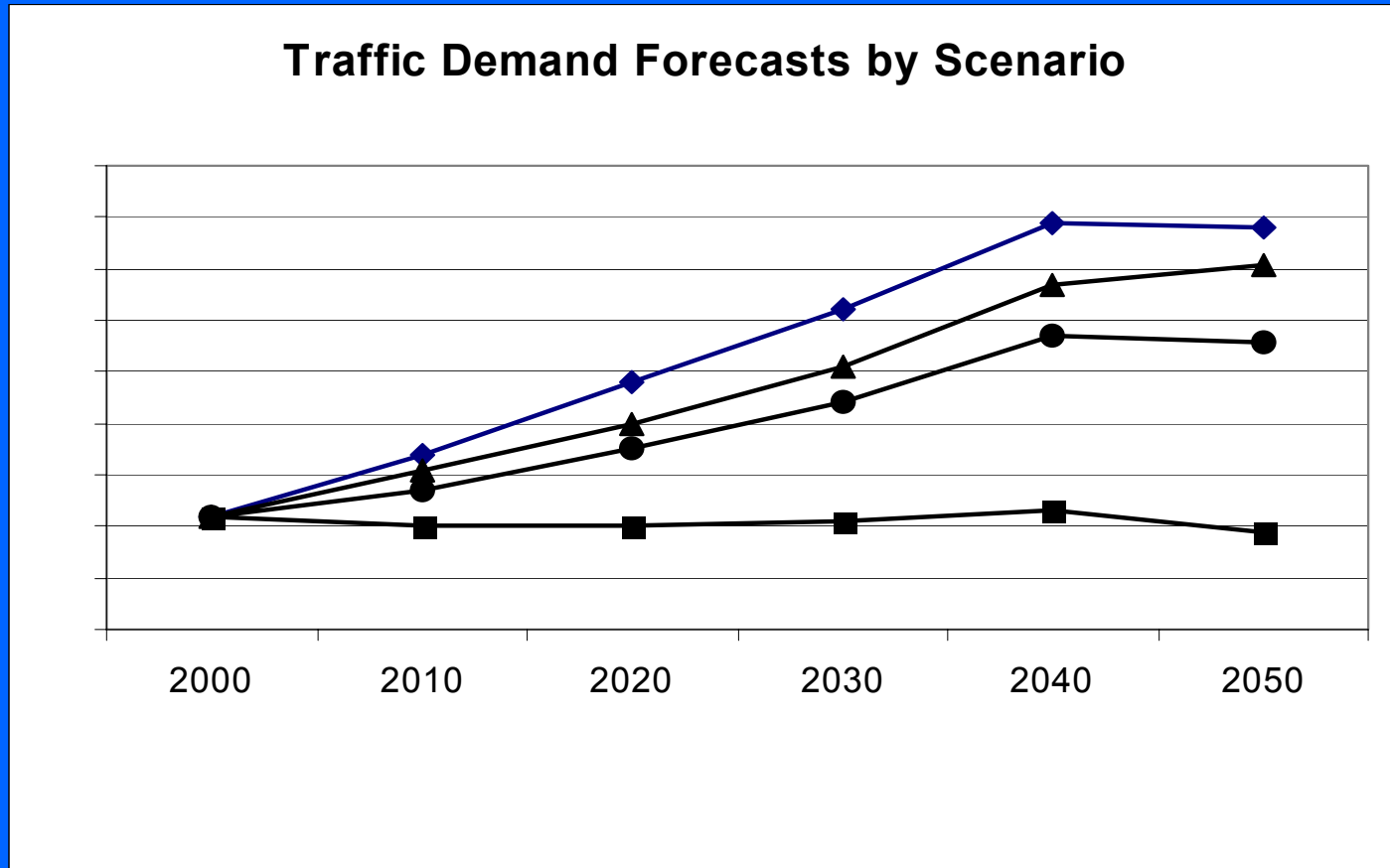
INP-MAY 03

Step 6 – Forecast Potential Waterway Traffic by Commodity

(ER 1105-2-100)

INP-MAY 03

Traffic Scenarios



The background of the slide is a faded, high-angle photograph of a large suspension bridge, likely the Tacoma Narrows Bridge, spanning a body of water. A large cargo ship is visible in the lower-left foreground, moving towards the bridge. The text is overlaid on this image.

INP-MAY 03

Step 7 – Determine Future Cost of Alternative Mode

(ER 1105-2-100)

The background of the slide is a photograph of a large, multi-arched steel truss bridge spanning a wide river. In the foreground, a long barge is being pushed or pulled by a tugboat. The barge is loaded with numerous colorful intermodal containers in shades of blue, red, yellow, and white. The scene is captured from a slightly elevated angle, showing the water's surface and the bridge's structure.

INP-MAY 03

Step 8 – Determine Future Cost of Waterway Use

(ER 1105-2-100)

The background of the slide is a photograph of a large, multi-arched steel truss bridge spanning a wide river. In the foreground, a long barge is being pushed or pulled by a tugboat. The barge is loaded with numerous rectangular objects, likely construction materials or equipment, arranged in neat rows. The water is calm, and the sky is overcast.

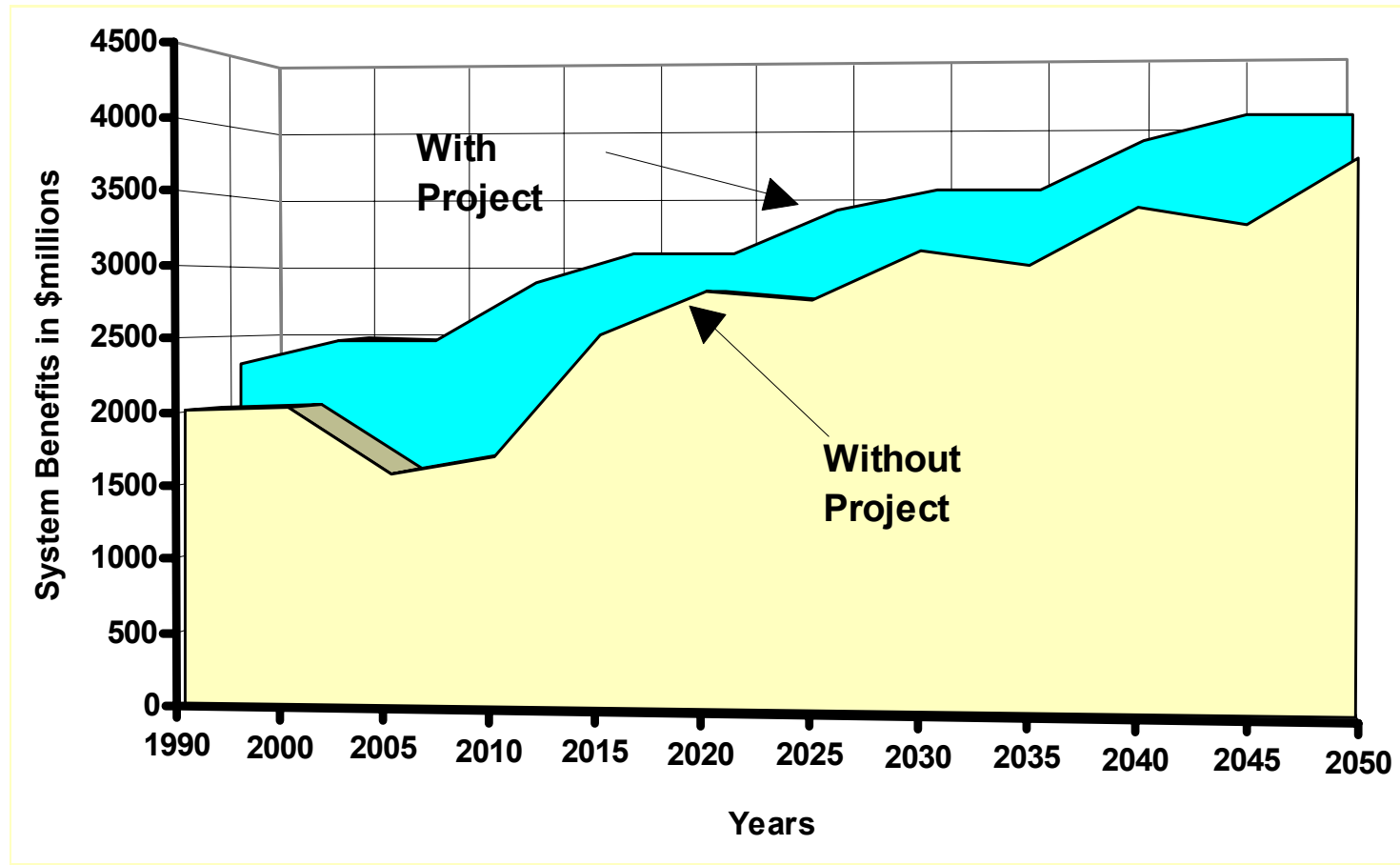
INP-MAY 03

Step 9 – Determine Waterway Use, With and Without-Project

(ER 1105-2-100)

Current Practice and Issues

Incremental Benefit Stream

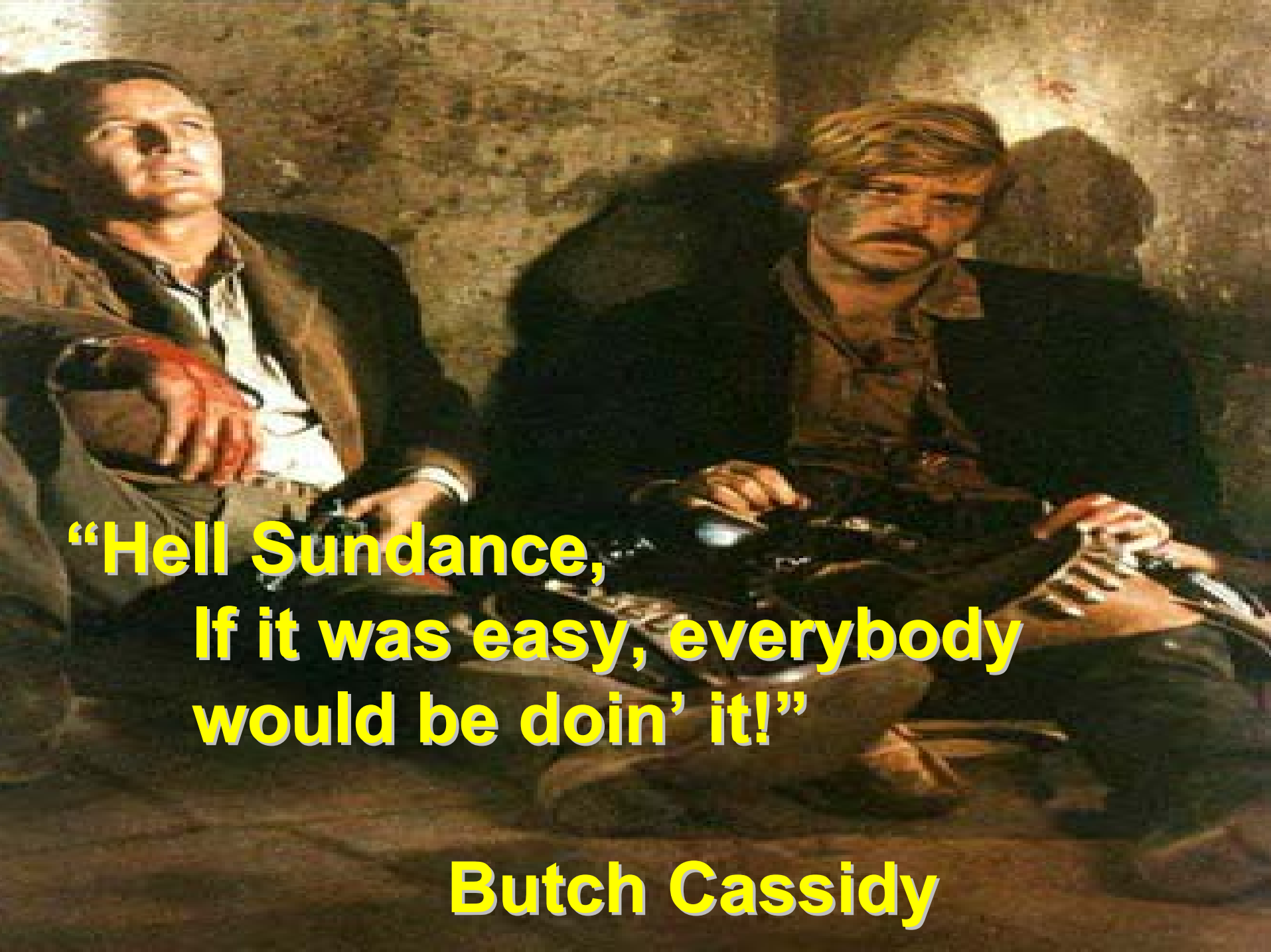


A large container ship is sailing on a body of water, passing under a large suspension bridge. The ship is filled with many colorful shipping containers. The bridge has a complex steel truss structure. The water is calm, and the sky is overcast.

INP-MAY 03

Step 10 – Compute NED Benefits

(ER 1105-2-100)



**“Hell Sundance,
If it was easy, everybody
would be doin’ it!”**

Butch Cassidy



INP-MAY 03

IV. Practical Issues

Selected Problems

- ✓ Shippers & Congestion
- ✓ Capacity Management
- ✓ Traffic Scenarios
- ✓ Externalities
- ✓ Disjointed incrementalism

A large cargo ship, densely packed with multi-colored shipping containers, is seen from an elevated perspective as it travels across a body of water. In the background, a large steel truss bridge with a prominent arch spans the water. The scene is slightly hazy, suggesting a distant or elevated viewpoint.

INP-MAY 03

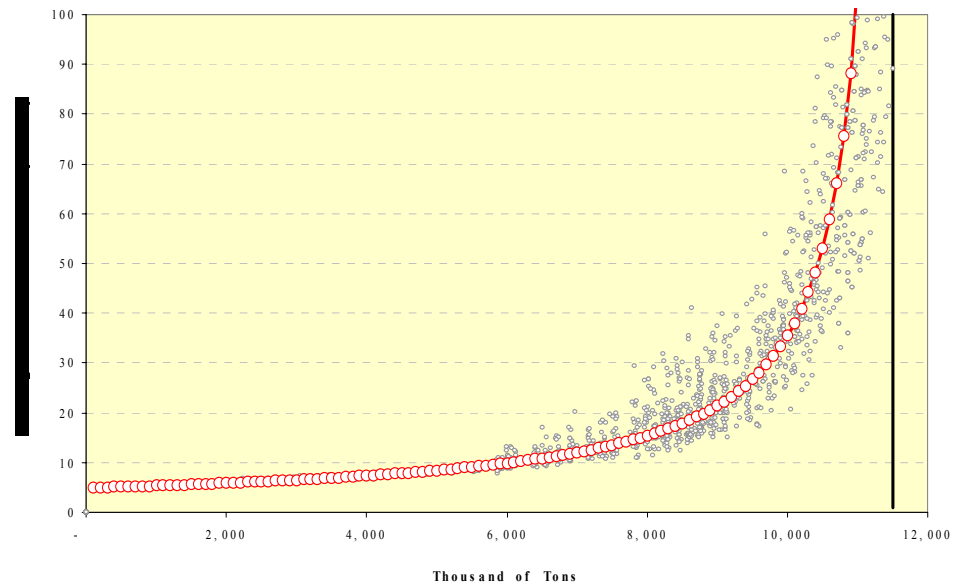
**“Nobody goes there
anymore, it’s too crowded”**

Yogi Berra

Current Practice and Issues

Modeling Lock Congestion

- Discrete-event simulation
- WAM requires detailed data input
- Shipment is randomly generated using LPMS distributions
- Based on the tow characteristics & project state, shipment is processed
- Statistics are accumulated and an average delay for the year is calculated



**Tonnage-Transit Curve WAM
Simulation Results**

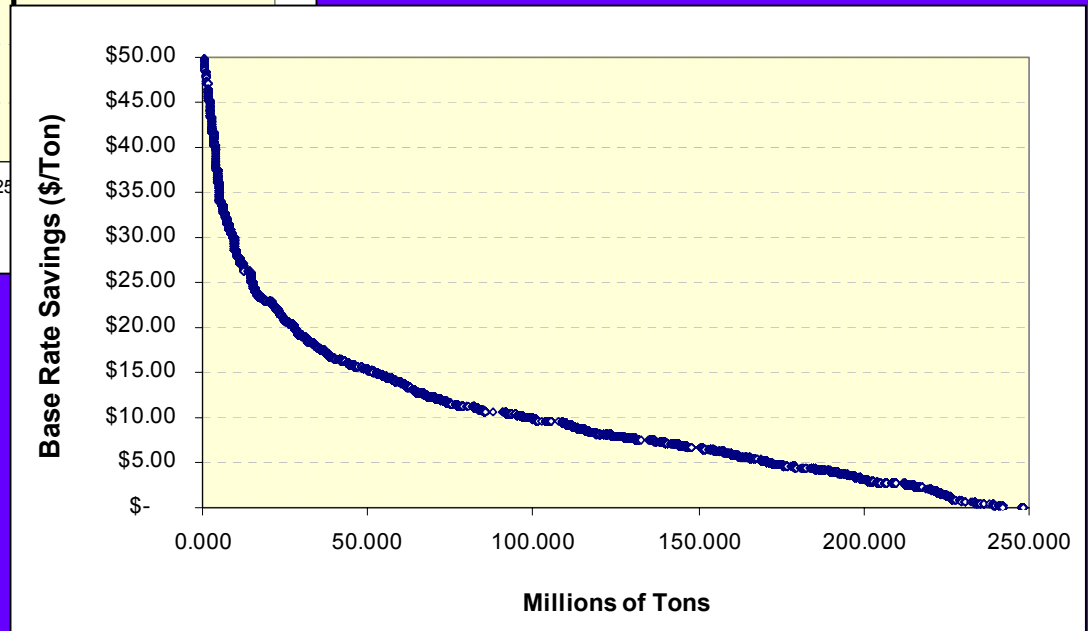
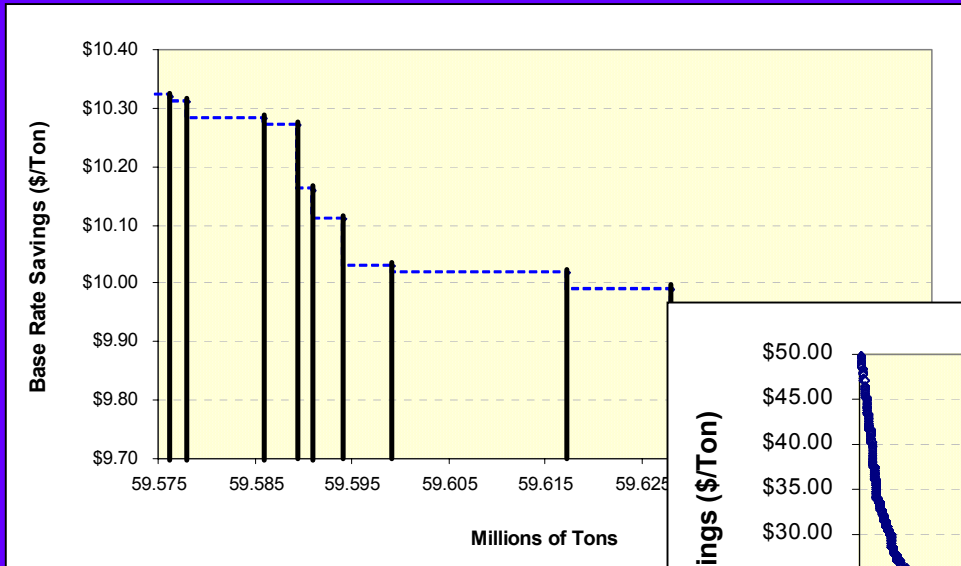
INP-MAY 03

ORS Rate-savings

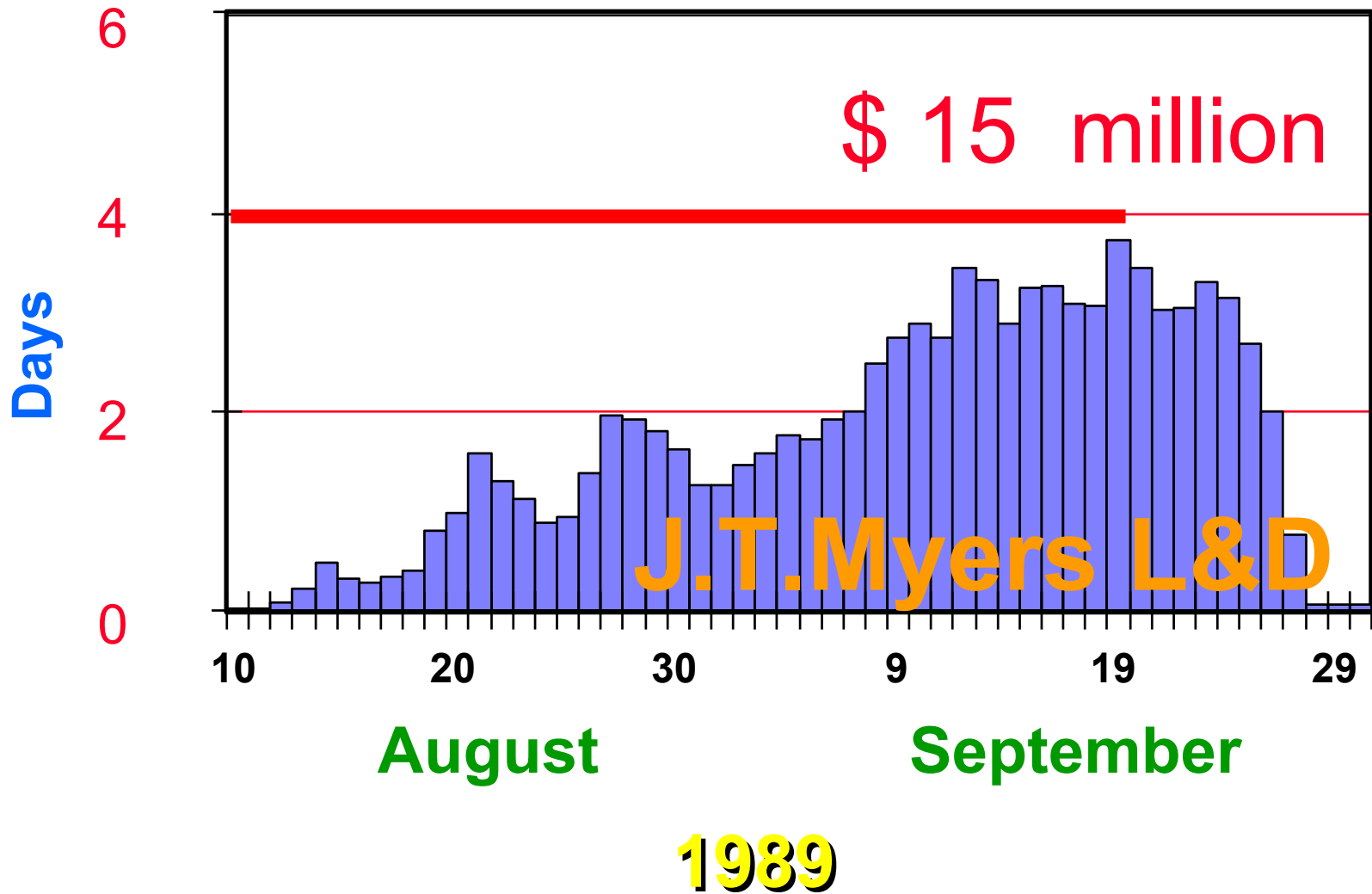
US Army Corps
of Engineers

Ranked Movements

Great Lakes & Ohio River Division



Average Daily Delay Per Tow



INP-MAY 03

Selected Problems

- ✓ Shippers & Congestion
- ✓ Capacity Management
- ✓ Traffic Scenarios
- ✓ Externalities
- ✓ Disjointed incrementalism

INP-MAY 03

Capacity Management

- ✓ Small Scale Improvements
- ✓ Helper Boats
- ✓ Lockage Policies
- ✓ Scheduled Lockages
- ✓ Congestion Fees

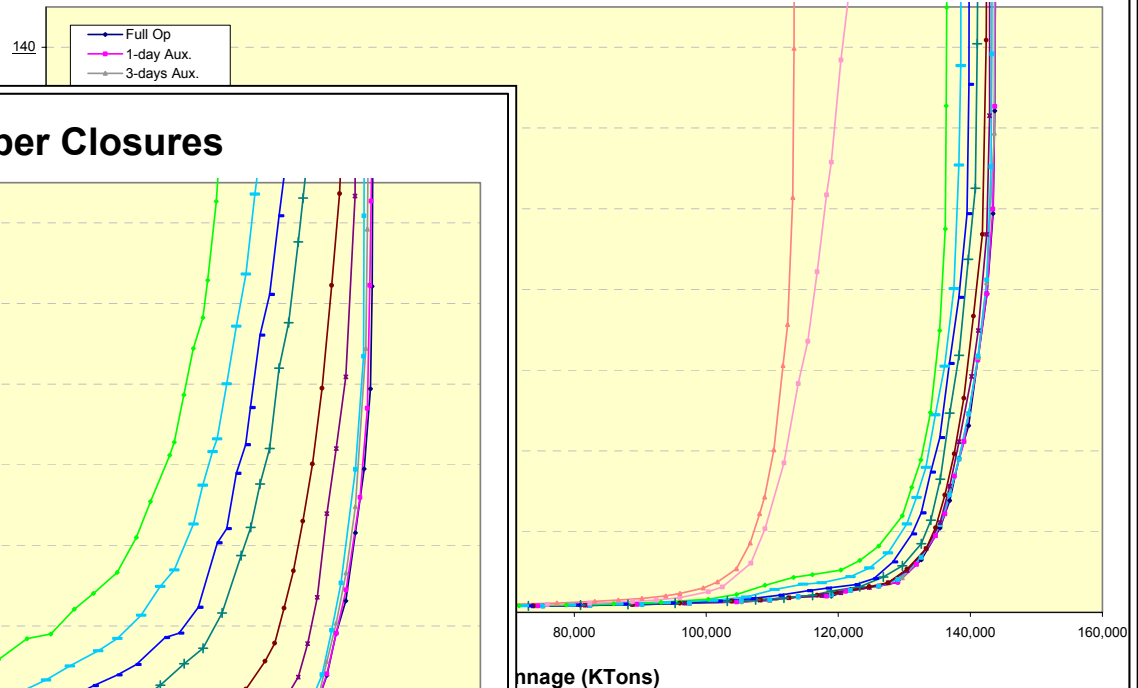
INP-MAY 03

**US Army Corps
of Engineers**

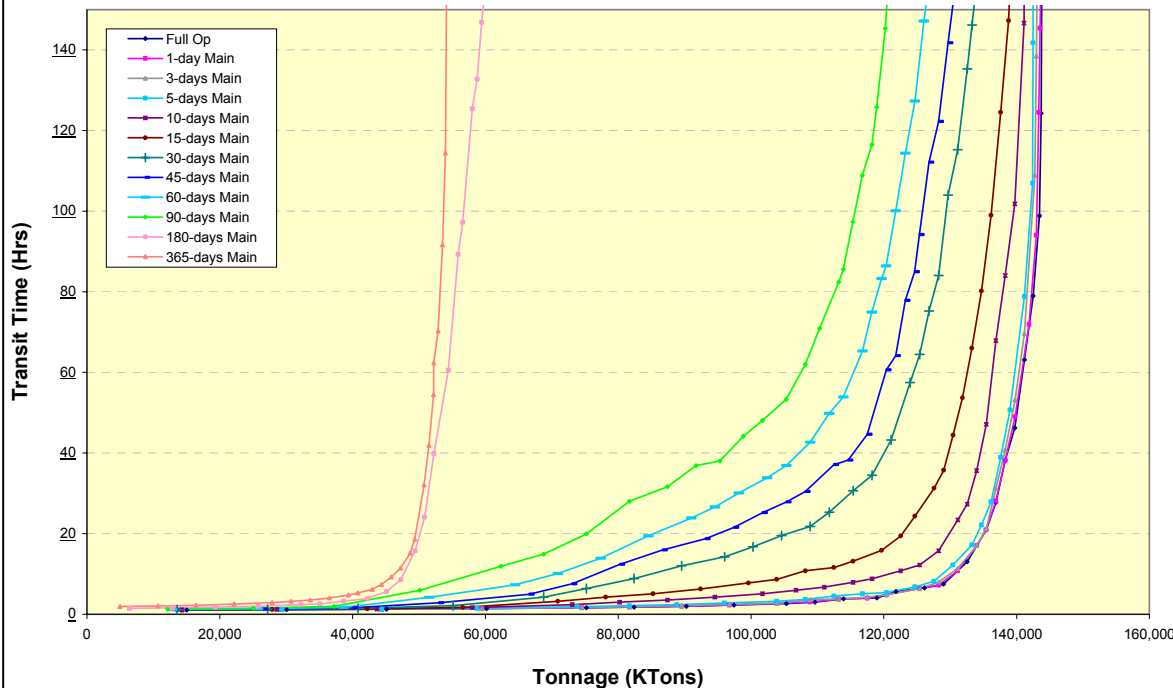
Great Lakes & Ohio River Division

Tonnage-Transit Relationships

Greenup Aux Chamber Closures



Greenup Main Chamber Closures



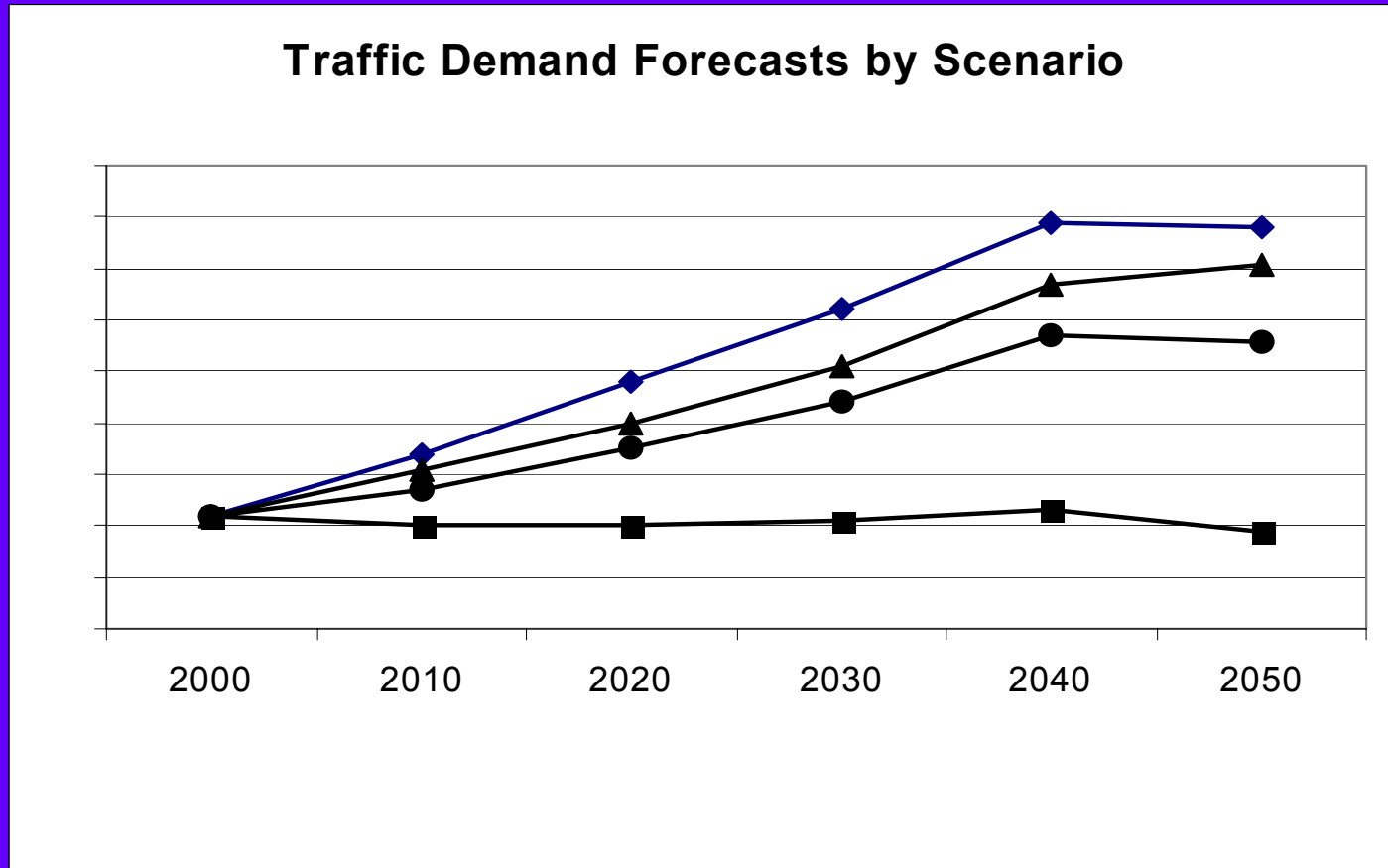
INP-MAY 03

Selected Problems

- ✓ Shippers & Congestion
- ✓ Capacity Management
- ✓ Traffic Scenarios
- ✓ Externalities
- ✓ Disjointed incrementalism

INP-MAY 03

Traffic Scenarios



Key Drivers for Coal

- Population → Electricity demand
- Income growth → Electricity demand
- Energy intensity → Electricity demand
- Government utility regulation → Electricity demand and coal use

INP-MAY 03

Selected Problems

- ✓ Shippers & Congestion
- ✓ Capacity Management
- ✓ Traffic Scenarios
- ✓ Externalities
- ✓ Disjointed incrementalism

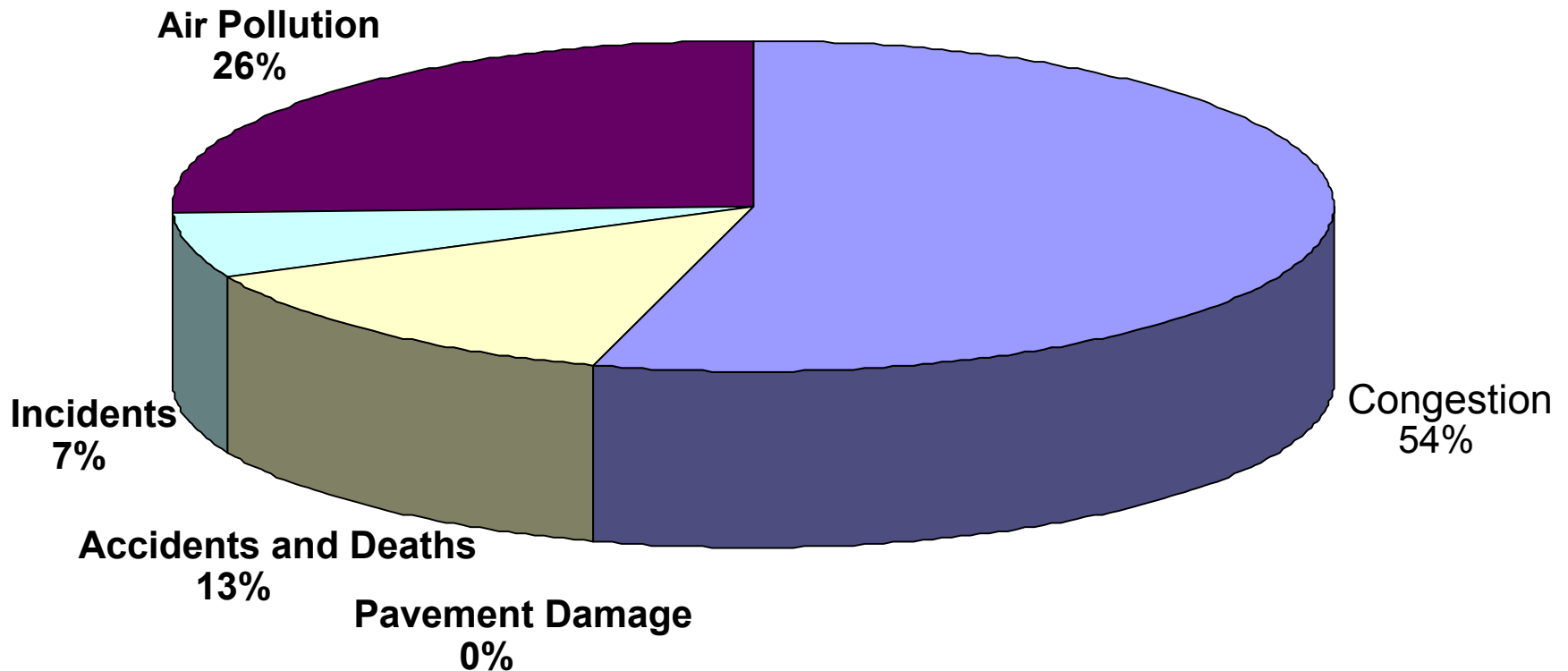
Other Transportation Impacts

Air Quality

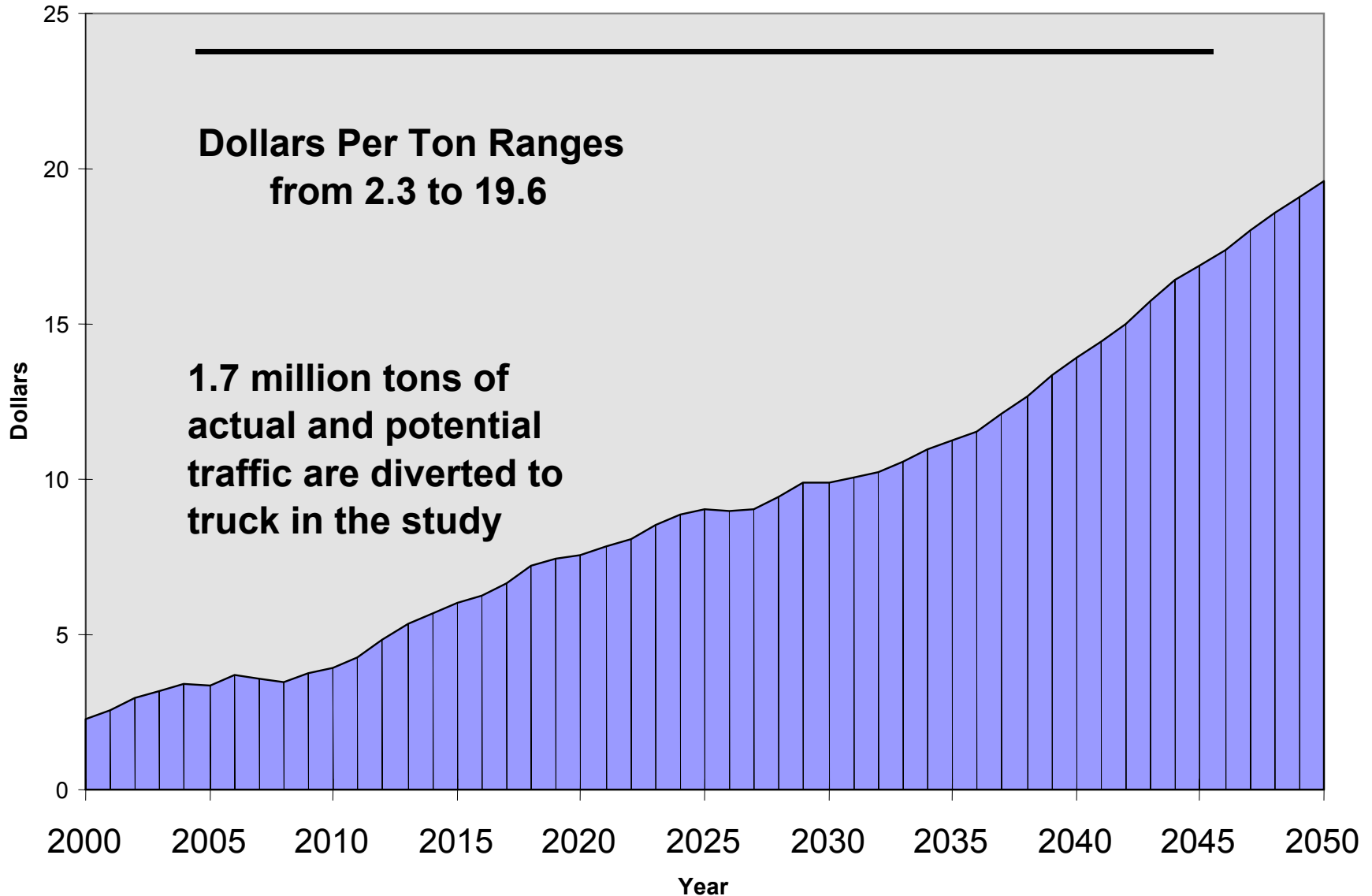


Highway Safety

Externality Costs Associated With An Unscheduled 180 Day Closure of Chickamauga Lock



Externality Costs Per Ton of Diverted Traffic



INP-MAY 03

Selected Problems

- ✓ Shippers & Congestion
- ✓ Capacity Management
- ✓ Traffic Scenarios
- ✓ Externalities
- ✓ Disjointed incrementalism

INP-MAY 03

"disjointed incrementalism"

“...better data will help the system to be understood. Reiterating what we've known for ages – you can't manage what you can't measure -- better information should lead to better infrastructure utilization.”

Stephen Van Beek,
Associate Deputy
Secretary of Transportation

Recurring Themes

- ✓ Uncertainty in the Present
- ✓ Uncertainty in the Future
- ✓ Comprehensiveness
- ✓ External Pressures

INP-MAY 03

I. Planning Process

II. Evaluation Framework

III. Evaluation Procedures

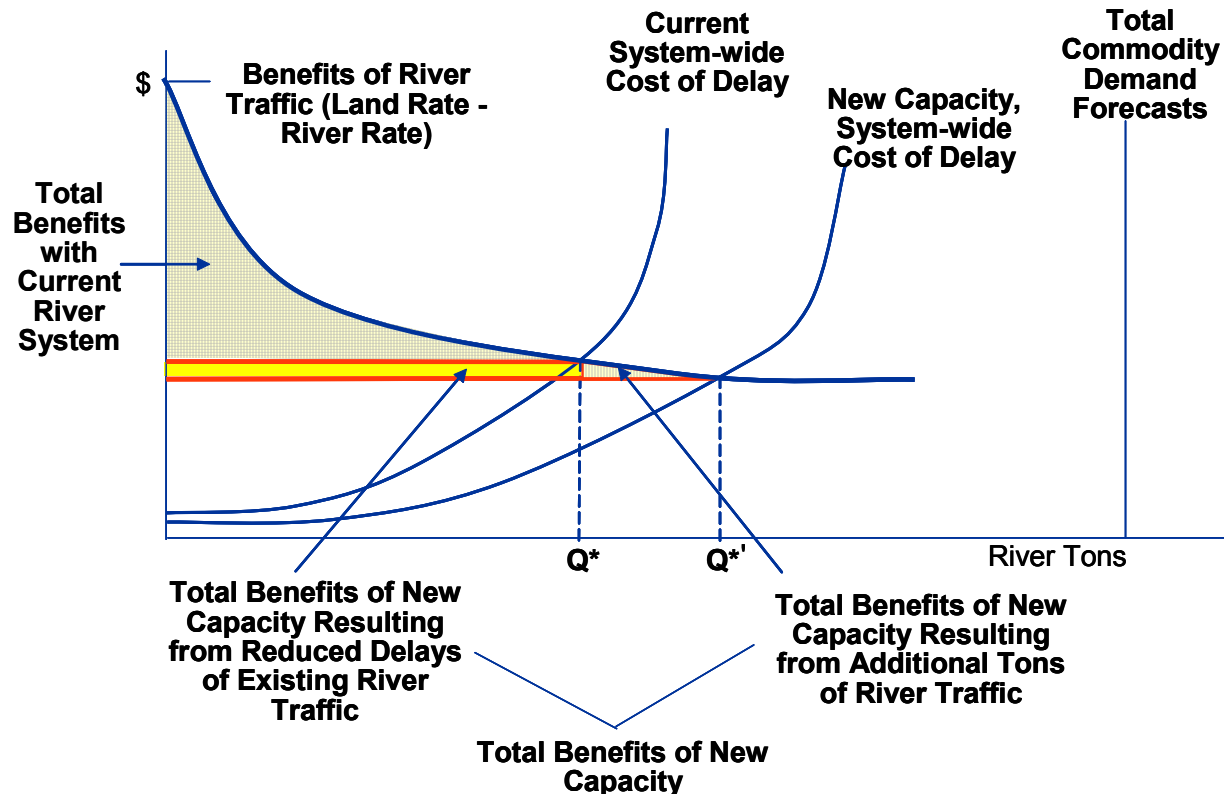
IV. Practical Issues

Current Practice and Issues

System Modeling

Are our analytical models appropriate to the task?

- Demand - ARS
- Supply - ATC
- Consumer surplus
- Producer surplus
- Without project
- With project
- Incremental analysis



Current Practice and Issues

Non-Structural Alternatives

Can we better manage the existing system?

- helper boats
- lockage policy
- cut limits
- traffic management
- traffic scheduling
- lockage fees
- small cap improvements

